

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 26

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YOSHITSUGU YAMADA

Appeal No. 2002-0697
Application No. 09/625,857

HEARD: January 9, 2003

Before COHEN, STAAB and McQUADE, Administrative Patent Judges.
McQUADE, Administrative Patent Judge.

DECISION ON APPEAL

Yoshitsugu Yamada appeals from the final rejection of claims 21 through 32, all of the claims pending in the application.

THE INVENTION

The invention relates to "a batch-type kiln having particular applicability in the performance of firing treatments, such as a dewaxing step and a firing step, on a ceramic product, such as a ceramic capacitor" (specification, page 1).

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Representative claim 21 reads as follows:

21. A batch-type kiln, comprising:

(a) a kiln body;

(b) a heating chamber disposed within the kiln body, the heating chamber having a heater disposed therein;

(c) a table disposed at the bottom of the heating chamber, the table having a peripheral portion and an upper surface for supporting an object to be treated, the peripheral portion of the table and a portion of the kiln body defining a gap there between, the gap forming a gas-introducing path for introducing a gas into the heating chamber, wherein the gap comprises a horizontal component and a vertical component continuous with each other; and

(d) a plurality of gas supply tubes arranged concentrically with respect to the heating chamber for introducing a gas into the heating chamber, each gas supply tube having a plurality of blow openings.

THE PRIOR ART

The references relied on by the examiner as evidence of obviousness are:

Okase	5,329,095	July 12, 1994
Shimada et al. (Shimada)	5,383,984	January 24, 1995

THE REJECTION

Claims 21 through 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Okase in view of Shimada.

Attention is directed to the brief (Paper No. 15) and answer (Paper No. 16) for the respective positions of the appellant and

examiner with regard to the merits of this rejection.¹

DISCUSSION

I. Grouping of claims

In the brief, the appellant states that "[t]he claims stand or fall together" (page 4). In accordance with this statement and pursuant to 37 CFR § 1.192(c)(7), we shall decide the appeal as to the rejection before us on the basis of representative claim 21 alone. Claims 22 through 32 shall stand or fall with claim 21.

II. The merits

Okase, the examiner's primary reference, discloses a thermal treatment apparatus used in the fabrication of semiconductor devices. The exemplary diffusion apparatus embodiments S and S1 respectively illustrated in Figures 1 and 7 include a process tube 21 with a bottom opening 23, a reaction gas introduction pipe 33 having a plurality of orifices 34, exhaust openings 25 in

¹ In the final rejection (Paper No. 7), claims 21 through 32 also stood rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,207,573 to Miyagi et al. in view of Shimada. As this rejection has not been restated or otherwise mentioned in the answer, we assume it has been withdrawn by the examiner. See Ex parte Emm, 118 USPQ 180, 181 (Bd. App. 1957).

the process tube, a coil-shaped heater 22, thermal insulation material 32, an outer shell 50, and a lid body 26 adapted to support a quartz boat 24 carrying a plurality of semiconductor wafers W and to open and close the bottom of the process tube.

Of particular interest is the lid body design shown in Figure 7 which is constructed to accommodate a shaft 38 for rotating the quartz boat and wafers. As described by Okase,

[a] circulation path 41 for circulation gas is formed of a circulation gas introduction opening 42 which is connected to a circulation gas supply body and which is provided in the lid body 26 of the dispersion apparatus S1, and also a pair of components 53 and 54 of a matching saw-tooth shape in cross-section, via a gap 41a between the shaft 38 and the penetration hole 45 of the lid body 26. The part of the circulation path 41 for the circulation gas that is in the gap 41a in contact with the upper part of the shaft 38 is provided so as to bend along the penetration hole 45 which is drilled through the lid body 26 and which has a radius that varies in a step-wise manner. The gas circulation path also bends along an inner surface portion 41b that is in contact with the heating gas over a wide surface area on the inner surface of the lid body 26, and the hightemperature [sic] gas that passes therealong is led to a circulation gas exhaust opening 43.

A gap 44 is provided so as to bend between the inner walls of the process tube 21 as far as the exhaust openings 25 of the process tube 21, provided above the circulation gas exhaust opening 43. Thus, the flow of circulation gas within the gap 44 is configured so that the circulation gas exhausted from the circulation gas exhaust opening 43 passes through this gap 44 and is exhausted from the exhaust openings 25, and thus reaction products do not invade downward from the gap 44 [column 6, lines 6 through 33].

To operate the S1 diffusion apparatus, a quartz boat 24 containing untreated wafers W is mounted on the lid body 26 and the lid body is raised to lift the boat 24 and wafers W into the process tube 21 and to close the bottom of the tube.

Subsequently,

[a]ir is evacuated from within the process tube 21 through the exhaust openings [25] and the process tube 21 is also heated to the prescribed temperature of between 900°C . and 1200°C . by the heater 22. Reaction gas is then introduced into the process tube 21 from the reaction gas introduction pipe 33. The reaction gas is supplied to the semiconductor wafers W . . . from the plurality of supply orifices 34 drilled in the reaction gas introduction pipe 33. A gas such as POCl_3 or O_2 is used as the reaction gas to diffuse phosphorous into the semiconductor wafers W. The apparatus is then evacuated through the exhaust openings 25 by an exhaust apparatus, to exhaust both excess reaction gas and also any reaction products.

At this point, a circulation gas such as N_2 or Ar is supplied from the circulation gas introduction opening 42 to the circulation path 41 for circulation gas provided in the lid body 26. The circulation gas is heated to the vaporization temperature of the reaction products, from 100°C . to 150°C ., passes from the circulation gas introduction opening 42, through inner surface portion 41b of the circulation path 41 formed . . . along the gap 41a by the shaft 38 connected to the motor shaft, and is exhausted from the circulation gas exhaust opening 43. Therefore, the inner wall portion of the lid body 26 by the process tube 21 is heated to between 100°C . and 200°C ., to ensure that reaction products do not adhere to the lid body 26. Circulation gas that does not exhaust from the circulation gas exhaust opening 43 passes through the gap 44 . . . and is discharged from the exhaust openings 25. The gap 44 is arranged so as to bend, so that reaction components such as Cl_2 and HCl that are generated in the process tube 21 do not intrude toward

the lid body 26. The gap 41a between the lid body 26 and the shaft 38 is of a radius that varies in a stepwise manner, the circulation gas circulates in the reverse direction therein, and thus the reaction product gases do not pass between the lid body 26 and the shaft 38, and thus do not leak into the clean room in which the dispersion [sic, diffusion] apparatus S1 is installed [column 6, line 64, through column 7, line 38].

As conceded by the examiner (see page 3 in the answer), the Okase apparatus does not respond to the limitation in representative claim 21 requiring "a plurality of gas supply tubes arranged concentrically with respect to the heating chamber for introducing a gas into the heating chamber." The Okase apparatus has but one such gas supply tube 33.

The appellant's contention that Okase also fails to respond to the limitation in the preamble of claim 21 calling for a "batch-type kiln" is not persuasive. During patent examination claims are to be given their broadest reasonable interpretation consistent with the underlying specification without reading limitations from the specification into the claims. In re Prater, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550-51 (CCPA 1969). Webster's New Collegiate Dictionary (G. & C. Merriam Co. 1977) defines the term "kiln" as meaning "an oven, furnace, or heated enclosure used for processing a substance by burning, firing, or drying." This definition, which is fully consistent with the

description of the kiln in the appellant's specification, accurately portrays Okase's thermal treatment apparatus S1. Since this apparatus functions to process batches of semiconductor wafers W (see Okase at column 1, lines 29 through 32), it constitutes a "batch-type kiln" as broadly recited in claim 21. The appellant's position to the contrary rests on an improper reading of limitations from the specification into the claim.

Shimada discloses a semiconductor wafer/substrate processing apparatus which differs from Okase's apparatus in that it is employed to carry out dry etching and ashing operations. The Shimada apparatus comprises

a process tube for enclosing a plurality of substrates; means for introducing a process gas into the process tube; means for exhausting the process gas from the process tube; electrode means arranged along the outer circumference of the process tube and serving to generate a high frequency electric field, when power is supplied, in a process-gas-introduced region to make the process gas into plasma; first power supply means for supplying power to the electrode means; heater means arranged in the process tube to directly heat the plural substrates, second power supply means for supplying power to the heater means; and means for controlling the amount of power supplied from the second power supply means to the heater means [column 2, lines 32 through 47].

In the illustrated version of the Shimada apparatus, the means for introducing the process gas into the process tube takes

the form of two diametrically opposed gas injectors or pipes 30 each having plural jet openings 31. Shimada also teaches, however, that "[t]he injector 30 may be single or more than three" (column 8, lines 66 and 67).

In proposing to combine Okase and Shimada to reject claim 21, the examiner concludes that it would have been obvious "to provide the apparatus of Okase with a plurality of gas supply tubes . . . as taught by Shimada et al. in order to improve the system efficiency" (answer, pages 3 and 4). The appellant counters (see pages 4 through 10 in the brief) that given the structural and functional differences between the Okase and Shimada devices there is no teaching, suggestion or incentive to combine the two as proposed by the examiner.

Notwithstanding their differences, the Okase and Shimada devices constitute semiconductor thermal treatment apparatuses wherein a process gas is fed into and exhausted from a processing chamber. One of ordinary skill in the art would have readily appreciated Shimada's teaching that the gas may be fed into the chamber via one, two or more than three gas introduction pipes or tubes to be applicable to similar devices, such as that disclosed by Okase, and that the use of plural tubes would improve the efficiency of the device, as observed by the examiner, by

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providing a more uniform processing atmosphere. This appreciation would have provided ample suggestion or motivation to modify the Okase device by including a plurality of gas supply tubes arranged concentrically with respect to the chamber for introducing a gas into the chamber as recited in claim 21.

Thus, the combined teachings of Okase and Shimada justify the examiner's conclusion that the differences between the subject matter recited in claim 21 and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. We shall therefore sustain the standing 35 U.S.C. § 103(a) rejection of claim 21, and claims 22 through 32 which stand or fall therewith, as being unpatentable over Okase in view of Shimada.

SUMMARY

The decision of the examiner to reject claims 21 through 32 is affirmed.

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No time period for taking any subsequent action in
connection with this appeal may be extended under 37 CFR
§ 1.136(a).

AFFIRMED

IRWIN CHARLES COHEN)	
Administrative Patent Judge)	
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